2. INTERCONVERSION OF STATES OF MATTER

TEACHING TASK

JEE MAIN LEVEL QUESTIONS

1. When a liquid starts boiling, the further heat energy which is supplied -
A) is lost to the surrounding as such.
B) increasing the temperature of the liquid.
C) increases the kinetic energy of the liquid.
D) is absorbed as latent heat of vaporisation by the liquid.
Answer:D
Solution:During boiling, the temperature remains constant (boiling point).
The supplied heat energy is used to overcome intermolecular forces (latent heat of vaporization) rather than increasing temperature or kinetic energy.

2. 10^0C temperature is equal to -
A) 163 K B) 10 K C) 183 K D) 283 K
Answer:D
Solution:Kelvin = Celsius + 273.15
10°C = 10 + 273 = 283 K

3. Which of the following will respond to sublimation ?
A) Common salt B) Sugar C) Camphor D) Potassium nitrate
Answer:C
Solution:Camphor sublimes (changes directly from solid to gas).
Common salt, sugar, and potassium nitrate do not sublime under normal conditions.

4. Rate of evaporation depends upon -
A) temperature B) surface area C) humidity D) All of these
Answer:D
Solution:Evaporation depends on temperature, surface area,humidity

5. During evaporation of liquid -
A) the temperature of the liquid falls.
B) the temperature of the liquid rises.
C) the temperature of the liquid remains unchanged.
D) all statements are wrong.
Answer:A
Solution:Evaporation is a cooling process as faster-moving molecules escape, lowering the average kinetic energy of remaining molecules.

6. Which is more effective in cooling ?
A) Water at 0°C B) Water at 100°C C) Ice at 0°C D) All of these
Answer:C

Solution:Ice at 0°C is more effective because it absorbs additional latent heat (334 J/g) during melting, providing more cooling than water at the same temperature.

7. The temperature at which Celsius and Fahrenheit scales show the same reading is

A) 40° K B) 100° F C) – 40° C D) – 100°C

Answer:C

Solution:- Take °C = −40°C.

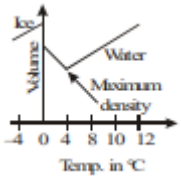
Formula, $°F = \frac{9}{5}(°C) + 32$.

$= \frac{9}{5} \times (-40) + 32$

$= -72 + 32$

$= -40°F$.

8. In an experiment of conversion of ice into water and water into vapour, observations were recorded and a graph plotted for temperature against time as shown below. From the graph it can be concluded that :-



A) Ice takes time to heat up to 0°C

B) During melting and boiling temperature does not rise

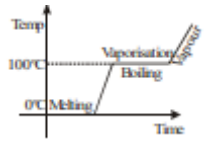
C) Process of boiling takes longer time than the process of melting

D) All the above

Answer:C

Solution:In the conversion of ice to water there is increase in 4° C temperature but Process of boiling takes longer time than the process of melting.

9. Study the graph given below and select the correct statement :



A) When water is cooled to 4°C it contracts

B) At 0°C water freezes

C) The volume of ice is more than that of water

D) All of these

Answer:B

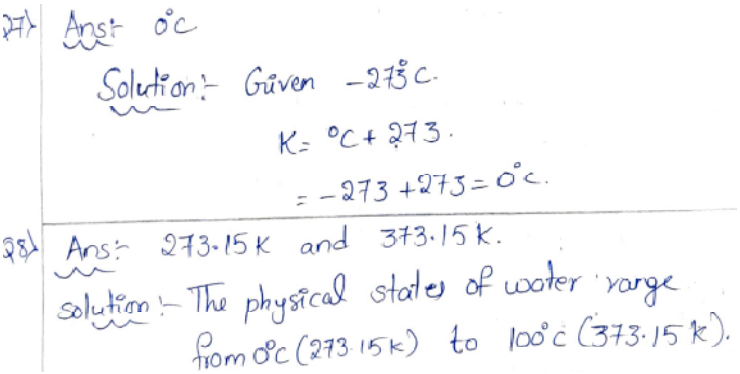
Solution:At 0^oC water freezes because melting temperature is 0^oC.
Melting point=Boiling Point
10. Corresponding temperature in the Kelvin scale for 104°C F is :
A) 313 K B) 203 C) 308 K D) 377 K
Answer:D

Solution :- $K = {}^\circ C + 273\,K$.
Given $^\circ C = 104^\circ C$.
$K = 104 + 273$
$= 377\,K$.

JEE ADVANCED LEVEL QUESTIONS
Multi Correct Answer Type
1. Which of the following statement is incorrect
1. Air, water, chair, table and smell are examples of matter.
2. Gases have highest rate of diffustoin among all the three states of matter.
3. Evaporation causes heating.
4. Camphor changes to gaseous state without changing into liquid.
A) 1,2,3 B) 1,3,4 C) 1,2,3,4 D) 3,4
Answer:1,3
Solution:
All listed items (air, water, chair, table) are matter but not smell Smell.
Evaporation causes cooling.
2. Which substance undergo sublimation process –
A) Naphthalene B) CO_2 C) Dry Ice D) N_2
Answer:A,B,C
Solution:Naphthalene (A):
Sublimes at room temperature (used in mothballs).
CO_2 (B) / Dry Ice (C):
Dry ice is solid CO_2, which sublimes at -78.5°C.
Statement Type
3. Statement-I : Boiling point of a liquid increases with increase in temperature.
Statement-II: The volume of liquids increases on boiling and the vaporisation curve shows the variation of the boiling point of a liquid with pressure and expands the equilibrium state between liquid and vapour phase.
Answer:D

Solution::Statement-I (False):
The boiling point of a liquid depends on pressure, not temperature. It is the temperature at which vapor pressure equals external pressure.
Increasing temperature does not increase boiling point; rather, increasing pressure raises the boiling point.
Statement-II (True):
Correctly describes:
(i) Liquid expansion on boiling,
(ii) Vaporisation curve (boiling point vs. pressure),
(iii) Liquid-vapour equilibrium.
4. Statement-I : In polar regions aquatic life is safe in water under frozen ice.
Statement-II: Water has a high latent heat of fusion and the upper portion of ice does not allow the heat of the water to escape to the surroundings.
Answer:A
Solution:Statement-I (True):
Ice acts as an insulator, maintaining liquid water below it at ~4°C (temperature of maximum density), allowing aquatic life to survive.
Statement-II (True):
High latent heat of fusion (334 J/g for ice) means large heat loss is required to freeze water, slowing further ice formation.
Ice's low thermal conductivity traps heat in the water below.
Comprehension Type
5. Which of the following statements are correct
A) If the melting point of a substance is above the room temperature at the atmospheric pressure, it is called solid.
B) If the boiling point of a substance is above room temperature under atmospheric pressure, it is classified as liquid.
C) If the boiling point of the substance is below the room temperature at the atmospheric pressure it is called gas.
D) All the above
Answer:D
Solution:Statement A (Correct):A substance is solid at room temperature if its melting point is above ~25°C (e.g., iron, NaCl).
Statement B (Correct):A substance is liquid at room temperature if:Melting point below room temperature and

Boiling point above room temperature (e.g., water, ethanol).
Statement C (Correct):A substance is gas at room temperature if its boiling point is below ~25°C (e.g., oxygen, CO_2).
6. A, B, D, and F in the above diagram
A) A : Fusion, B : Vaporizations, D : Solidification, F : Sublimation
B) A : Sublimation , B : Vaporizations, D : Solidification, F : Fusion
C) A : Fusion, B : Solidification, D : Vaporizations, F : Sublimation
D) A : Sublimation , B : Vaporizations, D :Fusion, F : Solidification
Answer:A
Solution:Fusion (A): Solid $\rightarrow$ Liquid (melting).
Vaporization (B): Liquid $\rightarrow$ Gas (boiling/evaporation).
Solidification (D): Liquid $\rightarrow$ Solid (freezing).
Sublimation (F): Solid $\rightarrow$ Gas (direct transition, e.g., dry ice).
Integer Type
7. -273^{0}C in kelvin scale is =_____
Answer:0
8. The physical of water ranges from _____K to _____K
Answer:273.15K to 373.15K



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Matrix Matching Type
9. **Answer:a-4,b-3,c-2,d-1**
Solution:

Column-I	Column-II
a) Liquifaction	4) Gaseous state to liquid state
b) Melting point	3) Solid changes into liquid
c) Freezing point	2) Liquid changes into solid
d) Sublimation	1) Solid state to direct gaseous state

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ'S)

1. On changing which of the following, the states of matter can be changed ?
A) Temperature B) Pressure C) A & B both D) None of these
Answer:C
Solution:

2. Melting & freezing point of water -
A) are same B) have large difference between them.
C) have close difference between them. D) None of these
Answer:A
Solution:Both occur at 0°C (273 K) under standard pressure. Melting (solid $\rightarrow$ liquid) and freezing (liquid $\rightarrow$ solid) are reverse processes at the same temperature.

3. Latent heat of vaporisation of water is -
A) 2.25 × 102 J/kg B) 22.5 × 105 J/kg C) 3.34 × 105 J/kg D) 33.4 × 102 J/kg
Answer:B
Solution: Latent heat of vaporisation of water is 2260 kJ/kg = 22.6 × 105 J/kg

4. S.I. unit of temperature is -
A) Kelvin B)Celsius C) Both D) None
Answer:A
Solution:Kelvin (K) is the SI base unit. Celsius (°C) is a derived unit.

5. Dry ice means -
A) solid ammonia B) solid carbon dioxide C) solid sulphur dioxide D) normal ice
Answer:B
Solution: Dry ice means - solid carbon dioxide
Sublimes at -78.5°C (used as a coolant).

6. Pressure of air at sea level is -
A) one atmosphere B) 76 cm of Hg C) 760 mm of Hg D) All of these
Answer:D
Solution:1 atm = 76 cm Hg = 760 mm Hg.

7. One atmosphere is equal to -
A) 1.01×10^5 Pa B) 3.46×10^4 Pa C) 1 Pa D) 10 Pa
Answer:A
Solution:Standard conversion: 1 atm = 101,325 Pa ˜ 1.01×10^5 Pa.

8. Name the process by which a drop of ink spreads in a beaker of water –
A) Diffusion B) Vaporization C) Condensation D) Sublimation
Answer:A

Solution:Random movement of ink particles in water due to kinetic energy.

9. The temperature at which a solid changes into liquid at atmospheric pressure is called

A) Melting point B) Boiling point C) Diffusion D) Evaporation

Answer:A

Solution:The temperature at which a solid changes into liquid at atmospheric pressure is called Melting point

10. Convert the temperature of 373°C to the kelvin scale ?

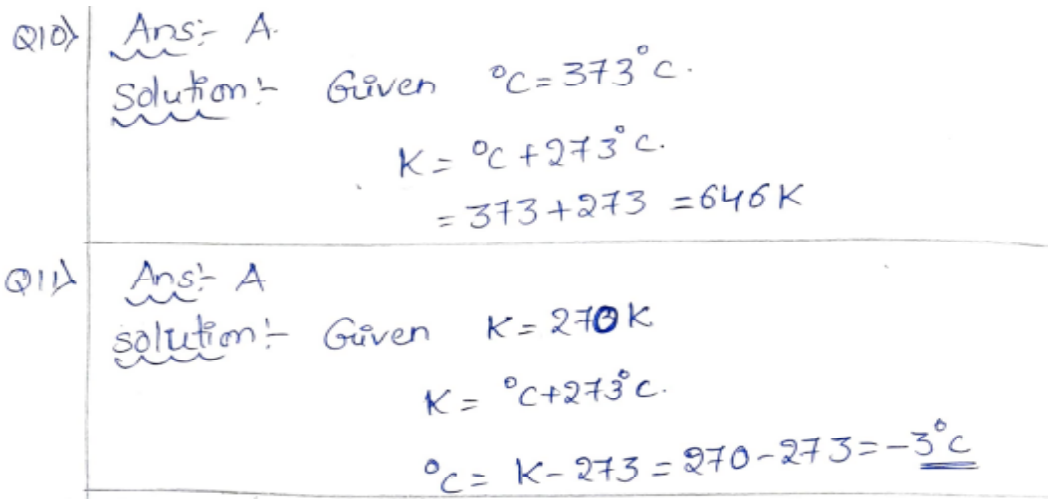
A) 646 K B) 546 K C) 300 K D) 500 K

Answer:A

11. Convert the temperature of 270 K to the celsius scale –

A) – 3°C B) – 4°C C) 2°C D) 5°C

Answer:A



12. The process for the change of a solid directly into its vapour is called –

A) Evaporation B) Ebullition C) Condensation D) Sublimation

Answer:D

Solution:The process for the change of a solid directly into its vapour is called Sublimation

JEE MAINS LEVEL QUESTIONS

1. The boiling point of alcohol is 78°C. What will be the temperature in Kelvin scale ?

A) 373 K B) 351 K C) 375 K D) 78 K

Answer:B

Soloution:

K = °C + 273.15

= 78 + 273.15

= 351.15 K ˜ 351 K

2. In sublimation process -

A) solid changes into liquid B) liquid changes into gas.

C) solid changes directly into gas. D) None of these

Answer:C

Solution:Sublimation is the direct transition from solid to gas without passing through the liquid phase (e.g., dry ice, camphor).

3. Solids cannot be compressed because -

A) constituent particles are very closely packed.

B) interparticle attractive forces are weak.

C) movement of constituent particles is restricted.

D) constituent particles diffuse very slowly.

Answer:A

Solution:The closely packed arrangement of particles in solids leaves almost no space between them, making compression nearly impossible.

4. On a hot humid day rate of evaporation -

A) is more B) is less C) initially more, later on less D) remains same.

Answer:B

Solution:High humidity means the air is already saturated with water vapor, reducing the evaporation rate.

5. During evaporation, particles of a liquid change into vapours only -

A) form the surface. B) from the bulk.

C) from both surface and bulk. D) neither from surface nor from bulk.

Answer:A

Solution:Evaporation occurs only at the surface of the liquid, unlike boiling which occurs throughout the bulk.

6. As temperature increases rate of evaporation -

A) increasesB) decreases C) first increases, then decreases.D) remains same.

Answer:A

Solution:Higher temperature provides more kinetic energy to surface molecules, enabling them to escape as vapor more easily.

7. A gas can be best liquefied -
A) by increasing the temperature. B) by lowering the pressure.
C) by increasing the pressure and reducing the temperature.
D) None of these is correct.
Answer:C
Solution:This combination brings gas particles closer (pressure) and reduces their kinetic energy (temperature), facilitating liquefaction.
8. In which phenomenon water changes into water vapour below its boiling point
A) Evaporation B) Condensation C) Boiling D) No such phenomena exists
Answer:A
Solution:Evaporation occurs at all temperatures below boiling point, while boiling occurs only at the boiling point.
9. When the vapour pressure of a liquid is equal to its atmospheric pressure, then it
A) Freezes B) Evaporates C) Boils D) Does not undergo any change
Answer:C
Solution:Boiling occurs when a liquid's vapor pressure equals the external atmospheric pressure.
10. When ice is converted into water :-
A) Heat is absorbed B) Heat is released
C) Temperature increases D) Temperature decreases
Answer:A
Solution:The process requires latent heat of fusion (334 J/g) to break the ice's crystalline structure, making it endothermic. Temperature remains constant at 0°C during the phase change.

JEE ADVANCED LEVEL QUESTIONS

Multi Correct Answer Type

1.Which of the following statement is incorrect
1. Intermolecular forces are maximum in solids and minimum in gases.
2. Condensing is opposite to evaporating and freezing is opposite to melting.
3. The large volumes of gases can be put into small volumes of cylinders because of their property known as compressibility.
4. Increase in humidity is out of the factor which increases the rate of evaporation.
A) 1,4 B) 1,3,4 C) 1,2,3,4 D) 1,2,3,
Answer:A
Solution:Statement 1 (Incorrect):
Says only "solids have max forces, gases have min."

Missing Liquids! (Correct order: Solids > Liquids > Gases).
Statement 4 (Incorrect):
Claims "humidity increases evaporation."
Truth: High humidity decreases evaporation (air is already full of vapor).

Statement Type

2. Statement-I : The change in state from solid to liquid is known as melting.
Statement-II : The temperature at which a solid melts is called the melting point of the solid.

Answer:A

Solution:Statement-I (True):
Melting is indeed the process where a solid changes to a liquid (e.g., ice ? water).
Statement-II (True):
Melting point is the specific temperature at which this phase change occurs (e.g., 0°C for ice).
Connection:
Statement-II defines the key condition (temperature) for the process described in Statement-I, making it a valid explanation.

Comprehension Type

3. The temperature at which a gas changes into a liquid state is called:
A) Boiling point B) Freezing point C) Liquefaction point D) Melting poinht

Answer:C

Solution:Liquefaction point is the temperature (and pressure) at which a gas condenses into a liquid.

4. The change in state from liquid to gaseous is known as:
A) Evaporation B) Vapourisation C) Both 1 and 2 D) Condensation

Answer:C

Solution:Evaporation (A): Occurs at any temperature below boiling point (e.g., water drying at room temp).
Vaporization (B): General term for liquid$\rightarrow$ gas, including boiling (rapid vaporization at boiling point).
Condensation (D): Gas $\rightarrow$Liquid (opposite process).

Integer Type

5. The temperature at which both melting and freezing point of water coincide is____

Answer:0

Solution:Melting point of ice (solid $\rightarrow$ liquid) = 0°C

Freezing point of water (liquid $\rightarrow$ solid) = 0°C

Under standard atmospheric pressure (1 atm), these two temperatures are identical for water.

Matrix Matching Type

6.**Answer:a-3,b-1,c-2,d-4**

Solution:

Column-I	Column-II
a) The molecules are made up of smaller particles	3) Atoms
b) Matter is made up of	1) Molecules
c) The constant temperature at which gas changes into a liquid state	2) Liquefaction point
d) Solids vapourise without melting	4) Sublimation

KEY

				TEACHING TASK					
				JEE MAIN LEVEL QUESTIONS					
1	2	3	4	5	6	7	8	9	10
D	D	C	D	A	C	C	C	B	D
				JEE ADVANCED LEVEL QUESTIONS					
1	2	3	4	5	6	7	8		9
1,3	A,B,C	D	A	D	A	0	273.15 TO 373.15K		a-4,b-3,c-2
				LEARNERS TASK					
			CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ'S)						
1	2	3	4	5	6	7	8	9	10
C	A	B	A	B	D	A	A	A	A
11	12								
A	D								
				JEE MAINS LEVEL QUESTIONS					
1	2	3	4	5	6	7	8	9	10
B	C	A	B	A	A	C	A	C	A
				JEE ADVANCED LEVEL QUESTIONS					
1	2	3	4	5	6	7			
A	A	C	C	0	a-3,b-1,c-2,d-4				